

What is claimed is:

1. A method for regulating the expression of a preselected gene in a cell, comprising the steps of:

5 providing a cell wherein the expression of the preselected gene is under the control of a preselected transcriptional regulatory protein expressed from a gene in the cell; and

causing RNA silencing against the mRNA transcript for the transcriptional regulatory protein so that the activity of the transcriptional regulatory protein in the cell is diminished.

10 2. The method of claim 1, wherein the transcriptional regulatory protein is a transcriptional repressor protein.

3. The method of claim 1, wherein the transcriptional regulatory protein is a transcriptional activator protein.

15 4. The method of claim 1, wherein at least one of the preselected gene and the gene encoding the transcriptional regulatory protein is a transgene.

5. The method of claim 1, wherein the preselected gene does not naturally occur under control of the transcriptional regulatory protein.

6. A method for regulating the expression of a preselected gene in a cell, comprising the steps of:

20 providing a cell wherein the expression of the preselected gene is under the control of a preselected transcription-regulating RNA expressed from a gene in the cell; and

causing RNA silencing against the transcription regulating RNA.

25 7. The method of claim 6, wherein at least one of the preselected gene and the gene encoding the transcription-regulating RNA is a transgene.

8. The method of claim 6, wherein the preselected gene does not naturally occur under control of the transcription regulating RNA.

9. A cell wherein the expression of a preselected gene is responsive to the presence of polynucleic molecules having at least one region of predetermined sequence, comprising:
- a preselected gene, wherein the expression of the gene is under the control of a preselected transcriptional regulator selected from the group consisting of a
- 5 transcriptional regulatory protein or a transcription-regulating RNA molecule;
- a gene expressing the preselected transcriptional regulator,
- wherein the gene expressing the preselected transcriptional regulator comprises a region of sequence rendering the RNA transcript of the gene as a target for RNA silencing as a result of the presence of the at least one polynucleic acid molecule
- 10 comprising the predetermined sequence in the cell.
10. The cell of claim 9, wherein the region of sequence of the gene for the transcriptional regulator is at least substantially homologous to a region of the predetermined sequence.
11. The cell of claim 9, wherein the region of sequence of the gene for the transcriptional regulator is at least substantially complementary to a region of the predetermined
- 15 sequence.
12. The cell of claim 9, wherein the region of sequence of the gene for the transcriptional regulator is selected to render the RNA transcript of the gene a target for transitive RNA silencing.
13. A transgenic multi-cellular organism comprising at least one cell according to claim
- 20 9.
14. A transgenic animal comprising at least one cell according to claim 9.
15. A transgenic plant comprising at least one cell according to claim 9.
16. A cell wherein the expression of a preselected gene is responsive to the presence of polynucleic molecules having at least one region of predetermined sequence, comprising:
- 25 a preselected gene, wherein the expression of the gene is under the control of a preselected transcriptional regulator selected from the group consisting of a transcriptional regulatory protein or a transcription-regulating RNA molecule;
- a gene expressing the preselected transcriptional regulator,

means for rendering the RNA transcript of the gene as a target for RNA silencing in response to the presence of the at least one polynucleic acid molecule comprising the predetermined sequence in the cell.

17. A method for selectively excising a preselected DNA sequence from a cellular
5 genome, comprising the steps of:

providing a cell comprising a series of DNA sequences that includes an excisable
sequence element that is bounded on either side by specific excision sequences, a
repressible promoter operably linked to a gene encoding a site specific recombinase
capable of recognizing the specific excision sequences, and a gene operably encoding a
10 repressor protein specific for the repressible promoter; and

causing RNA silencing against the mRNA transcript for the repressor protein so
that expression of the site specific recombinase is derepressed thereby causing excision of
the excisable sequence element.

18. A cell wherein a preselected DNA sequence is excisable from the cellular genome in
15 response to the presence in the cell of a polynucleic acid molecule having at least one
region of predetermined sequence, comprising:

a series of DNA sequences that includes an excisable sequence element that is
bounded on either side by specific excision sequences, a repressible promoter operably
linked to a gene encoding a site specific recombinase capable of recognizing the specific
20 excision sequences, and a gene operably encoding a repressor protein specific for the
repressible promoter; and

means for causing RNA silencing against the mRNA transcript for the repressor
protein in response to the presence in the cell of a polynucleic acid molecule having the
region of predetermined sequence so that expression of the site specific recombinase is
25 derepressed thereby causing excision of the excisable sequence element.

19. The cell of claim 18, wherein the excisable sequence element comprises at least one
expression cassette comprising at least one preselected gene.

20. A multi-cellular organism comprising at least one cell according to claim 18.

21. The cell of claim 18, wherein the polynucleic acid molecule having at least one region of predetermined sequence is a viral polynucleic acid molecule.
22. The cell of claim 18, wherein the polynucleic acid molecule having at least one region of predetermined sequence is an RNA molecule.
- 5 23. The cell of 22, wherein the RNA molecule is a cellular RNA molecule.
24. The cell of 22, wherein the RNA molecule is a viral RNA molecule.
25. A method for bringing the expression of a preselected gene in a cell under the control of a preselected promoter, comprising the steps of:
- 10 providing a cell comprising a series of DNA sequences that includes a first promoter linked to a preselected gene, the promoter and preselected gene being separated by a blocking sequence that is in turn bounded on either side by specific excision sequences, a repressible promoter operably linked to a gene encoding a site specific recombinase capable of recognizing the specific excision sequences, and a gene operably encoding a repressor protein specific for the repressible promoter; and
- 15 causing RNA silencing against the mRNA transcript for the repressor protein so that expression of the site specific recombinase is derepressed thereby causing excision of the blocking sequence thereby operably linking the first promoter and the preselected gene so that the expression of the preselected gene is under the control of the first promoter.
- 20 26. The method according to claim 25, wherein the first promoter is a transiently-active promoter.
27. The method according to claim 25, wherein the first promoter is a constitutively-active promoter.
28. The method according to claim 25, wherein the first promoter is an inducible
- 25 promoter.
29. A cell wherein the expression of a preselected gene can be brought under the control of a preselected promoter in response to the presence in the cell of a polynucleic acid molecule having at least one region of predetermined sequence, comprising:

a series of DNA sequences that includes a first promoter linked to a preselected gene, the promoter and preselected gene being separated by a blocking sequence that is in turn bounded on either side by specific excision sequences, a repressible promoter operably linked to a gene encoding a site specific recombinase capable of recognizing the specific excision sequences, and a gene operably encoding a repressor protein specific for the repressible promoter; and

means for causing RNA silencing against the mRNA transcript for the repressor protein in response to the presence in the cell of a polynucleic acid molecule having the region of predetermined sequence so that expression of the site specific recombinase is derepressed thereby causing excision of the blocking sequence thereby operably linking the first promoter and the preselected gene so that the expression of the preselected gene is under the control of the first promoter.

- 30. The cell of claim 29, wherein the blocking sequence comprises at least one expression cassette comprising at least one preselected gene.
- 31. The cell of claim 29, wherein the first promoter is a transiently-active promoter.
- 32. The cell of claim 29, wherein the first promoter is a constitutively-active promoter.
- 33. The cell of claim 29, wherein the first promoter is an inducible promoter.
- 34. A multi-cellular organism comprising at least one cell according to claim 29.
- 35. A transgenic animal comprising at least one cell according to claim 29.
- 36. A transgenic plant comprising at least one cell according to claim 29.